

ATTACHMENT - CLAIMS LISTING

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Cancelled)
2. (Currently amended) A tissue ablation apparatus for ablating tissue comprising:
 - a phase-locked source of microwave radiation having a stable output frequency in the range of 5 to 60 GHz;
 - a probe connected to said phase-locked source, said probe being configured for directing said microwave radiation into said tissue to be ablated;
 - a local oscillator for producing a signal, having a frequency different from said frequency of said microwave radiation;
 - a first detector for detecting the magnitude and phase of a reflected portion of said microwave radiation reflected back through said probe towards said phase-locked source;
 - said first detector being connected to the local oscillator and configured to determine the magnitude and phase of said reflected portion of said microwave radiation by comparing said reflected portion of said microwave radiation with said signal produced by said local oscillator; and
 - an impedance adjuster connected between said phase-locked source of microwave radiation and said probe, said impedance adjuster having an adjustable complex impedance that is controllable based on said determined magnitude and phase of said reflected portion of said microwave radiation.
3. (Currently amended) An apparatus according to claim 2 further comprising a second detector for detecting the magnitude and phase of forward directed microwave radiation directed from said phase-locked source toward said probe, said second detector being connected to said local oscillator or a different local oscillator, the second detector being configured to determine the magnitude and phase of said forward directed microwave radiation by comparing it with a signal produced by said or said different local oscillator,

and wherein said adjustable complex impedance of the impedance adjuster is further controllable based on said determined magnitude and phase of said forward directed microwave radiation.

4. (Previously presented) An apparatus according to claim 3 further comprising a third detector for detecting the magnitude and phase of either forward directed microwave radiation or reflected microwave radiation, said third detector being connected to said local oscillator or a different local oscillator, the third detector being configured to determine the magnitude and phase of either said forward directed microwave radiation or said reflected microwave radiation by comparing it with a signal produced by said or said different local oscillator, and wherein said adjustable complex impedance of the impedance adjuster is further controllable based on said determined magnitude and phase of either said forward directed microwave radiation or said reflected microwave radiation.

5. (Previously presented) An apparatus according to claim 2 wherein said first detector comprises a mixer for mixing the signal from said local oscillator with said reflected portion of said microwave radiation.

6. (Previously presented) An apparatus according to claim 2 wherein said first detector comprises a power sensor and a phase comparator connected to said local oscillator.

7. (Currently amended) An apparatus according to claim 2 wherein said local oscillator is separate from said phase-locked source of microwave radiation.

8. (Currently amended) An apparatus according to claim 2 wherein said local oscillator is connected to said phase-locked source of microwave radiation and configured to produce a signal derived from said phase-locked source, but having a different frequency to the frequency of said phase-locked source of microwave radiation.

9. (Previously presented) An apparatus according to claim 2 further comprising a controller for automatically adjusting said adjustable complex impedance of said impedance adjuster on the basis of the magnitude and phase of said radiation detected by said detector.
10. (Previously presented) An apparatus according to claim 9 wherein said controller is configured to adjust said adjustable complex impedance dynamically in response to the variation in the magnitude and phase of said radiation detected by said detector.
11. (Previously presented) An apparatus according to claim 2 wherein said probe is configured to penetrate biological tissue.
12. (Previously presented) An apparatus according to claim 2 further comprising a separator for separating said reflected portion of said microwave radiation from forward directed microwave radiation being directed towards said probe.
13. (Previously presented) An apparatus according to claim 8 wherein said impedance adjuster is a stub tuner.
14. (Cancelled)
15. (Previously presented) An apparatus according to claim 2 wherein the probe is coaxial.
16. (Previously presented) An apparatus according to claim 2 wherein the probe is a waveguide.
17. (Previously presented) An apparatus according to claim 2 wherein the probe has an outer diameter of less than 1 mm.

18. (Currently amended) A microwave tissue ablation apparatus according to claim 2 wherein the phase-locked source of microwave radiation produces radiation of wavelength λ , and a radiation channeling means for conveying microwave radiation connects said impedance adjuster and said probe, said channeling means having an adjustable length whereby the combined length of said channeling means and said probe can be adjusted to be equal to a multiple of $\lambda/2$.

19. (Currently amended) A method of ablating tissue comprising the steps of:
using a phase-locked source of microwave radiation to provide microwave radiation having a stable output frequency in the range of 5 to 60 GHz;

placing a probe in contact with or inserting a probe into biological tissue;

directing said microwave radiation through said probe into the tissue to ablate the tissue;

detecting the magnitude and phase of a reflected portion of said microwave radiation reflected back through the probe by using a first detector and a local oscillator, the local oscillator producing a signal having a frequency different from said frequency of said microwave radiation and the first detector operating to determine the magnitude and phase of said reflected portion of said microwave radiation by comparing said reflected portion of said microwave radiation with said signal produced by said local oscillator, and

adjusting the complex impedance of an impedance adjuster connected between said phase-locked source and said probe on the basis of the magnitude and phase of the microwave radiation detected by said first detector.

20. (Currently amended) A method of ablating tissue comprising the steps of:

using a phase-locked source of microwave radiation to provide microwave radiation having a stable output frequency in the range of 5 to 60 GHz;

placing a probe in contact with or inserting a probe into biological tissue;

directing said microwave radiation from said phase-locked source through an impedance adjuster and then through said probe into said tissue to ablate the tissue;

said impedance adjustor having an input connected to said phase-locked source and an output connected to said probe, said input and said output having respective complex impedances;

detecting the magnitude and phase of a reflected portion of said microwave radiation that is reflected back through said probe towards the phase-locked source by using a first detector and a local oscillator; said local oscillator generating a signal having a frequency different from said frequency of said microwave radiation, said first detector using said local oscillator signal in combination with the reflected radiation or a signal derived from said reflected radiation to determine the magnitude and phase of said reflected radiation; and

adjusting said complex impedance of said output of said impedance adjustor on the basis of said magnitude and phase of said reflected microwave radiation detected by said first detector, so as to minimize the amount of microwave radiation which is reflected back through said probe.

21. (Previously presented) A method according to claim 19 wherein the probe is inserted into the tissue so that an end of the probe is proximate to or inside a cancerous tumor in the tissue and microwave radiation is then passed through the probe to ablate said cancerous tumor.

22. (Previously presented) A method according to claim 21 wherein the microwave radiation is used to cut a path in the tissue so that the probe can be inserted near to or into said tumor.

23. (Currently amended) A method according to claim 20 wherein the magnitude and phase of forward directed microwave radiation directed toward said probe from said phase-locked source of microwave radiation is detected by using a second detector and said local oscillator or a different local oscillator, and said adjustable complex impedance of said impedance adjuster is adjusted based on the signal magnitudes and phases detected by said first and second detectors.

24. (Original) A method according to claim 23 wherein a third detector is used to detect the magnitude and phase of either forward directed or reflected radiation and said adjustable complex impedance of said impedance adjuster is adjusted on the basis of information provided by said first, second and third detectors.

25. (Previously presented) A method according to claim 19 wherein said adjustable complex impedance of said impedance adjuster is adjusted automatically by a control means on the basis of said magnitude and phase detected by said detector so as to minimize the amount of microwave radiation reflected back through said probe.

26. (Previously presented) A method according to claim 25 wherein said impedance adjustment is carried out dynamically as the detected magnitude and phase varies.

27-39. (Canceled)

40. (Currently amended) A microwave tissue ablation apparatus according to claim 2 wherein the phase-locked source of microwave radiation is phase locked to a stable reference signal having a single frequency.

41. (Currently amended) A microwave tissue ablation apparatus according to claim 40 wherein the phase-locked source is tunable so that its stable output frequency can be varied in a controlled manner.

42. (Currently amended) A microwave tissue ablation apparatus according to claim 2 including a microwave amplifying system connected between the phase-locked source and the probe, the microwave amplifying system comprising a solid state power amplifier connected to receive at an input thereof the microwave radiation from the phase-locked source.